IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

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| In re Application of: | § | |
|     Jeffrey Tarvin | § | Group Art Unit: 3676 |
| | § | |
| Serial No.:   10/711,918 | § | |
| | § | Examiner: DiTrani, Angela M. |
| Filed:     October 13, 2004 | § | |
| | § | |
| For:   System and Method to Interpret | § | Atty Docket:   101.0166 |
| Distributed Temperature Sensor Data and to | | |
| Determine a Flow Rate in a Well | | |
| | § | |
| | § | |

Assistant Commissioner
  for Patents
Washington, D.C. 20231

Assistant Commissioner:

## REPLY BRIEF PURSUANT TO 37 C.F.R. §§ 41.31 AND 41.41

This Reply Brief is being filed in response to the Examiner's Answer dated September 1, 2009. The Examiner's Answer contains another new ground of rejection which has been addressed below. As stated in the June 15, 2009 Appeal Brief, Appellant appreciates that the Examiner agreed with Appellant's arguments in the original Appeal Brief filed July 30, 2008 and withdrew the rejections which had previously been consistently applied. However, Appellant questions the January 26, 2009 attempt to reopen prosecution by presenting 17 different claim rejections - after four and a half years of prosecution involving the expenditure of substantial time and money in prosecuting the present application. (The new ground for rejection is in addition to the 17 different claim rejections set forth in the January 26, 2009 attempt to reopen

prosecution - which has now been ongoing for over 5 years.) As discussed in greater detail below, Appellant once again believes the rejections are not supported and should be withdrawn.

## 1.    <u>REAL PARTY IN INTEREST</u>

The real party in interest is Schlumberger Technology Corporation, the Assignee of the above-referenced application by virtue of the Assignment recorded at reel 015241, frame 0832.

## 2.    <u>RELATED APPEALS AND INTERFERENCES</u>

The present application was previously appealed on July 30, 2008. Subsequently, an Office Action was mailed on January 26, 2009 to reopen prosecution, and the present Appeal has been initiated in response. Appellant is unaware of any interferences related to this Appeal. The undersigned is Appellant's legal representative in this Appeal. Schlumberger Technology Corporation, the Assignee of the above-referenced application, will be directly affected by the Board's decision in the pending appeal.

## 3.    <u>STATUS OF CLAIMS</u>

Claims 12-13, 32-33, 42, 49-94 have been canceled without prejudice, and claims 1-11, 14-31, 34-41, 43-48 stand rejected by the Examiner as noted in the January 26, 2009 Office Action mailed after the original Appeal Brief. The rejection of claims 1-11, 14-31, 34-41 and 43-48 is appealed.

## 4.    <u>STATUS OF AMENDMENTS</u>

The November 27, 2008 Amendment (received December 3, 2007) was submitted prior to the Examiner's Final Rejection mailed March 6, 2008 and was entered by the Examiner. A response was filed on May 5, 2008 after final, but no amendments were submitted and no amendments were entered after the March 6, 2008 Final Rejection.

## 5.    <u>SUMMARY OF THE CLAIMED SUBJECT MATTER</u>

    a.)    Independent Claim 1

Independent claim 1 is directed to a methodology for analyzing distributed temperature data from a well. *(See paragraph 9, page 7, lines 1-15).* The methodology uses a distributed temperature sensor system (20) for obtaining temperature profile data from a portion of a wellbore (12). *(See paragraph 20, page 10, lines 2-8).* The temperature profile data is provided to a processor (22) which automatically determines whether fluids are flowing into or out of a tubing (16) located in the well based on processing of the temperature profile data. *(See paragraph 20, page 10, lines 2-3; paragraph 21, page 11, lines 2-11).* The methodology further comprises highlighting valuable information to a user related to the flow of fluid relative to the tubing (16). *(See paragraph 22, page 11, lines 12-20).*

**b.)** Independent Claim 10

Independent claim 10 is directed to a methodology for analyzing distributed temperature data from a well. *(See paragraph 9, page 7, lines 1-15).* The methodology comprises obtaining temperature profile data from a portion of a wellbore (12). *(See paragraph 20, page 10, lines 2-8).* The temperature profile data is provided to a processor (22) which automatically processes the temperature profile data. *(See paragraph 20, page 10, lines 2-3; paragraph 21, page 11, lines 2-11).* The processing of temperature profile data highlights valuable information to a user and further comprises applying a model-fitting algorithm to the data. *(See paragraph 22, page 11, lines 12-20; paragraphs 27-28, page 16, lines 11-20; paragraph 30, page 18, lines 10-20).* The processing also comprises constructing a match filter which includes incorporating modifications to the match filter to make it orthogonal to background trends. *(See paragraphs 53-57, page 34, line 2, through page 37, line 5).*

**c.)** Independent Claim 22

Independent claim 22 is directed to a system (10) used to analyze distributed temperature data from a well. *(See paragraph 9, page 7, lines 1-15).* The system (10) comprises a distributed temperature sensor (20) which measures temperature profile data along a portion of a wellbore

(12). *(See paragraph 20, page 10, lines 2-8)*. The temperature profile data is provided to a processor (22) in real-time. *(See paragraph 23, page 13, lines 1-6)*. The processor (22) is programmed to identify a particular temperature signal that corresponds to a specific downhole event having an inflow of relatively cooler fluid. The processor (22) is further able to output valuable information related to the specific downhole event. *(See paragraphs 22-23, page 11, line 12, through page 13, line 6)*.

### d.)     Independent Claim 31

Independent claim 31 is directed to a methodology that enables detection of certain events within a well. The methodology uses a distributed temperature sensor system (20) for obtaining data related to temperature. *(See paragraph 20, page 10, lines 2-8)*. The data is obtained from a portion of a wellbore (12) over a period of time. The methodology further comprises automatically processing the data to detect specific events related to heat energy in the well. Data also is automatically processed to determine a flow rate of fluid in the well. *(See paragraphs 70-76, page 42, line 20, through page 46, line 14)*. The methodology further comprises displaying the results of the processing to a user. *(See paragraphs 23-24, page 12, line 11, through page 13, line 11)*.

### e.)     Independent Claim 40

Independent claim 40 is directed to a methodology that enables detection of certain events within a well. The methodology comprises obtaining data over a period of time from along a portion of a wellbore (12). *(See paragraph 20, page 10, lines 2-8)*. The data is automatically processed to detect specific events related to heat energy in the well. The automatic processing comprises applying a model-fitting algorithm *(See paragraphs 27-28, page 16, lines 11-20; paragraph 30, page 18, lines 10-20)* to the data which further includes constructing a match filter and using extrema of a convolution of the filter with data to select candidate depths. *(See paragraphs 53-59, page 34, line 2, through page 38, line 10)*. Constructing the match filter further comprises incorporating modifications to the filter to make it orthogonal to background

trends. *(See paragraphs 53-57, page 34, line 2, through page 37, line 5).* Additionally, the methodology comprises displaying results of the processing to a user. *(See paragraphs 23-24, page 12, line 11, through page 13, line 11).*

## 6. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

a.) Whether claims 1 and 21 are unpatentable under 35 U.S.C. § 102(b) as anticipated by the C.K. Woodrow (SPE/IADC 67729) reference.

b.) Whether claims 1, 6-8, 14, 21-26, 29, 31, 34-38, 46 and 48 are unpatentable under 35 U.S.C. § 102(b) as anticipated by the Brown reference (WO 01/04581).

c.) Whether claims 2 and 5 are unpatentable under 35 U.S.C. § 103(a) as obvious over the C.K. Woodrow (SPE/IADC 67729) reference in view of the Foster reference, US Patent No: 3,275,980.

d.) Whether claims 3 and 11 are unpatentable under 35 U.S.C. § 103(a) as obvious over the C.K. Woodrow (SPE/IADC 67729) reference in view of the Van Bemmel et al. reference, US Patent No: 6,201,884.

e.) Whether claim 4 is unpatentable under 35 U.S.C. § 103(a) as obvious over the C.K. Woodrow (SPE/IADC 67729) reference in view of the Charske et al. reference, US Patent No: 2,938,592.

f.) Whether claims 6-9 and 14 are unpatentable under 35 U.S.C. § 103(a) as obvious over the C.K. Woodrow (SPE/IADC 67729) reference in view of the Brown reference (WO 01/04581).

g.) Whether claim 15 is unpatentable under 35 U.S.C. § 103(a) as obvious over the C.K. Woodrow (SPE/IADC 67729) reference.

h.)     Whether claims 16-20 are unpatentable under 35 U.S.C. § 103(a) as obvious over the C.K. Woodrow (SPE/IADC 67729) reference in view of the Brune et al. reference, US Patent No: 6,756,783.

i.)     Whether claims 10 and 40 are unpatentable under 35 U.S.C. § 103(a) as obvious over the C.K. Woodrow (SPE/IADC 67729) reference in view of the Brune et al. reference, US Patent No: 6,756,783.

j.)     Whether claims 2 and 5 are unpatentable under 35 U.S.C. § 103(a) as obvious over the Brown reference (WO 01/04581) in view of the Foster reference, US Patent No: 3,275,980.

k.)     Whether claims 3 and 11 are unpatentable under 35 U.S.C. § 103(a) as obvious over the Brown reference (WO 01/04581) in view of the Van Bemmel et al. reference, US Patent No: 6,201,884.

l.)     Whether claim 4 is unpatentable under 35 U.S.C. § 103(a) as obvious over the Brown reference (WO 01/04581) in view of the Charske et al. reference, US Patent No: 2,938,592.

m.)     Whether claims 9, 15, 28 and 39 are unpatentable under 35 U.S.C. § 103(a) as obvious over the Brown reference (WO 01/04581).

n.)     Whether claims 16-20 and 47 are unpatentable under 35 U.S.C. § 103(a) as obvious over the Brown reference (WO 01/04581) in view of the Brune et al. reference, US Patent No: 6,756,783.

o.)     Whether claims 30 and 43-45 are unpatentable under 35 U.S.C. § 103(a) as obvious over the Brown reference (WO 01/04581) in view of the C.K. Woodrow (SPE/IADC 67729) reference.

p.)     Whether claims 10 and 40 are unpatentable under 35 U.S.C. § 103(a) as obvious over the Brown reference (WO 01/04581) in view of the Brune et al. reference, US Patent No: 6,756,783.

q.)     Whether claim 41 is unpatentable under 35 U.S.C. § 103(a) as obvious over the Brown reference (WO 01/04581) in view of the Tubel reference, US Patent No: 6,012,015.

r.)     **New Ground of Rejection:** Whether claim 27 is unpatentable under 35 U.S.C. § 103(a) as obvious over the Brown reference (WO 01/04581) in view of the C. K. Woodrow article, SPE/IADC 67729.

7.   **ARGUMENT**

**NEW GROUND OF REJECTION**

**r.) Rejection of claim 27 as unpatentable under 35 U.S.C. § 103(a) for being obvious over the Brown reference (WO 01/04581) in view of the C. K. Woodrow article, SPE/IADC 67729.**

Claim 27 was improperly rejected as obvious over the Brown reference in view of the C.K. Woodrow reference. No *prima facie* case of obviousness has been established.

Claim 27 ultimately depends from independent claim 22 and is patentable over the cited references for the reasons provided above with respect to independent claim 22 as well as for the additional unique subject matter recited in dependent claim 27. The Brown reference describes using a fiber optic sensor system to measure temperature along a conduit by deriving the thermal behavior of fluids flowing through massive underground formations which act as heat sinks, as discussed above. However, the Brown reference provides no disclosure or teaching related to a "processor being programmed to identify a particular temperature signal that corresponds to a specific downhole event" as recited in independent claim 22 and thus dependent claim 27. As such, there is no disclosure or suggestion that "the processor outputs valuable information related to the specific downhole event to a user" as further recited in independent claim 22 and thus dependent claim 27.

Furthermore, addition of the C. K. Woodrow reference does not obviate the deficiencies of the Brown reference to establish a *prima facie* case of obviousness. The C. K. Woodrow reference is cited as disclosing the wireless communication link recited in dependent claim 27, however the cited reference does not disclose this element. The Examiner simply states that the C. K. Woodrow reference discloses this feature but it does not. Instead, the C. K. Woodrow reference merely discusses that temperature data can be displayed on site, stored, or transmitted

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via modem or scada/modbus links - no reference is made to a wireless link. Accordingly, the reference does not refer to the wireless communication link recited in claim 27 and such teaching is only found in the present application. However, the present application can not be used as a roadmap to artificially expand the disclosure of the references cited against claim 27. Therefore, the rejection of dependent claim 27 under 35 USC 103(a) should be withdrawn.

**The following rejections were fully discussed in the June 15, 2009 Appeal Brief and that discussion has not been repeated. However, certain new issues raised in the Response to Argument section of the Examiner's Answer have been addressed below.**

**a.) Rejection of claims 1 and 21 as unpatentable under 35 U.S.C. § 102(b) as anticipated by the C.K. Woodrow (SPE/IADC 67729) reference.**

**- <u>Claims 1 and 21</u>**

Independent claim 1 was improperly rejected as anticipated by the C.K. Woodrow (SPE/IADC 67729) reference. The reference fails to disclose elements of the subject claims.

In the Response to Argument section of the Examiner's Answer, the C.K. Woodrow reference is said to disclose "automatically determining whether fluids are flowing into or out of a tubing located in the well by processing the temperature profile data" and Figure 4 of the C.K. Woodrow reference is cited as support. However, the C.K. Woodrow graph illustrated in Figure 4 only reflects perturbations of temperature. The Examiner is using the teachings of the present application to interpret those teachings in a manner to support her rejection, however even the authors of the C.K. Woodrow article state that the "full implications of the tremendous temperature fluctuations observed in the annulus of TA-27 have yet to be fully understood, as we have not yet established a thermal model that can accurately match the observed temperature profile." (see C.K. Woodrow page 3, second column, second paragraph). Accordingly, the C.K.

Woodrow reference does not adequately disclose determining whether fluids are flowing "into or out of a tubing" located in the well by processing the temperature profile data as recited in independent claim 1.

The Examiner further states that "automatically" determining whether fluids are flowing into or out of a tubing by processing the temperature profile data only requires that "one of ordinary skill looking at the processed/graphed temperature profile data" can recognize peaks in the data. (See Examiner's Answer, page 26). However, this "manual" interpretation of data is exactly opposite to the "automatically determining ... by processing the temperature profile data" as recited in independent claim 1 and supported in the specification. The clear meaning of claim terms/words cannot be ignored, or in this case dramatically changed, to create support for a given rejection. For at least these reasons and numerous other reasons discussed in the Appeal Brief, the rejection of claims 1 and 21 under 35 USC 102(b) is unsupported and must be withdrawn.

**b.) Rejection of claims 1, 6-8, 14, 21-26, 29, 31, 34-38, 46 and 48 as unpatentable under 35 U.S.C. § 102(b) as anticipated by the Brown reference (WO 01/04581).**

Independent claims 1, 22 and 31 were improperly rejected as anticipated by the Brown reference. The reference fails to disclose elements of the subject claims.

In the Response to Argument section of the Examiner's Answer, page 27, the Brown reference is said to disclose automatically determining whether fluids are flowing into or out of a tubing located in a well by processing temperature profile data. The Examiner cites page 12, beginning at line 27, and page 16, line 19, of the Brown reference as support for this assertion. However, the first passage cited only describes an optical fiber deployment tube 20 that is formed as a U-tube connected with a surface mounted instrumentation 22 which includes a laser light source, light detector, and data processing apparatus. The instrumentation 22 is used to pass light along an optical fiber, to receive returning light, and to interpret temperature characteristics at a series of locations along the optical fiber. The second passage cited by the Examiner describes

that the Brown method and apparatus may be calibrated when mass flow rates are determined independently by conventional means. Neither of these passages discusses any system or methodology for "automatically determining" whether fluids are flowing "into or out of a tubing" by processing the temperature profile data as recited in independent claim 1.

With respect to independent claim 22, the Brown reference similarly fails to disclose or suggest a "processor" programmed to identify a particular temperature signal "that corresponds to a specific downhole event having inflow of relatively cooler fluid". On pages 29 and 30 of the Examiner's Answer, the Brown reference is said to disclose such elements at page 3, line 28, through page 4, line 4, and page 16, lines 17-27. However, both of these passages are limited to a general discussion of determining mass flow rates of produced fluids in a wellbore. The passages fail to disclose any type of system or methodology that can be used to process data to identify temperature signals corresponding to specific downhole vents having an inflow of relatively cooler fluid, as set forth in independent claim 22. Consequently, the Brown reference cannot disclose or suggest a system in which the processor "outputs valuable information related to the specific downhole event to a user" as further recited in independent claim 22.

A similar analysis applies with respect to independent claim 31 which recites "automatically processing" the data related to temperature to "detect specific events related to heat energy in the well". For at least the reasons discussed above and for numerous other reasons discussed in the Appeal Brief, the rejection of claims 1, 22, 31 (along with their subject dependent claims) under 35 USC 102(b) is unsupported and must be withdrawn.

**c.) Rejection of claims 2 and 5 as unpatentable under 35 U.S.C. § 103(a) for being obvious over the C.K. Woodrow (SPE/IADC 67729) reference in view of the Foster reference, U.S. Patent No: 3,275,980.**

Claims 2 and 5 were improperly rejected as obvious over the C.K. Woodrow reference in view of the Foster reference. No *prima facie* case of obviousness has been established. Claims 2 and 5 directly depend from independent claim 1 and are patentable over the cited references for

at least the reasons cited in the June 15, 2009 Appeal Brief. Therefore, the rejection of dependent claims 2 and 5 under 35 USC 103(a) should be withdrawn.

**d.) Rejection of claims 3 and 11 as unpatentable under 35 U.S.C. § 103(a) for being obvious over the C.K. Woodrow (SPE/IADC 67729) reference in view of the Van Bemmel et al. reference, U.S. Patent No: 6,201,884.**

Claims 3 and 11 were improperly rejected as obvious over the C.K. Woodrow reference in view of the Van Bemmel et al. reference. No *prima facie* case of obviousness has been established. Claims 3 and 11 directly depend from independent claim 1 and are patentable over the cited references for at least the reasons cited in the June 15, 2009 Appeal Brief. Therefore, the rejection of dependent claims 3 and 11 under 35 USC 103(a) should be withdrawn.

**e.) Rejection of claim 4 as unpatentable under 35 U.S.C. § 103(a) for being obvious over the C.K. Woodrow (SPE/IADC 67729) reference in view of the Charske et al. reference, U.S. Patent No: 2,938,592.**

Claim 4 was improperly rejected as obvious over the C.K. Woodrow reference in view of the Charske et al. reference. No *prima facie* case of obviousness has been established. Claim 4 directly depends from independent claim 1 and is patentable over the cited references for at least the reasons cited in the June 15, 2009 Appeal Brief. Therefore, the rejection of dependent claim 4 under 35 USC 103(a) should be withdrawn.

**f.) Rejection of claims 6-9 and 14 as unpatentable under 35 U.S.C. § 103(a) for being obvious over the C.K. Woodrow (SPE/IADC 67729) reference in view of the Brown reference (WO 01/04581).**

Claims 6-9 and 14 were improperly rejected as obvious over the C.K. Woodrow reference in view of the Brown reference. No *prima facie* case of obviousness has been established. Claims 6-9 and 14 ultimately depend from independent claim 1 and are patentable over the cited

references for at least the reasons cited in the June 15, 2009 Appeal Brief. Therefore, the rejection of dependent claims 6-9 and 14 under 35 USC 103(a) should be withdrawn.

**g.) Rejection of claim 15 as unpatentable under 35 U.S.C. § 103(a) for being obvious over the C.K. Woodrow (SPE/IADC 67729) reference.**

Claim 15 was improperly rejected as obvious over the C.K. Woodrow reference. No *prima facie* case of obviousness has been established. Claim 15 directly depends from independent claim 1 and is patentable over the cited references for at least the reasons cited in the June 15, 2009 Appeal Brief. Therefore, the rejection of dependent claim 15 under 35 USC 103(a) should be withdrawn.

**h.) Rejection of claims 16-20 as unpatentable under 35 U.S.C. § 103(a) for being obvious over the C.K. Woodrow (SPE/IADC 67729) reference in view of the Brune et al. reference, US Patent No: 6,756,783.**

Claims 16-20 were improperly rejected as obvious over the C.K. Woodrow reference in view of the Brune et al. reference. No *prima facie* case of obviousness has been established. Claims 16-20 ultimately depend from independent claim 1 and are patentable over the cited references for at least the reasons cited in the June 15, 2009 Appeal Brief. Therefore, the rejection of dependent claims 16-20 under 35 USC 103(a) should be withdrawn.

**i.) Rejection of claims 10 and 40 as unpatentable under 35 U.S.C. § 103(a) for being obvious over the C.K. Woodrow (SPE/IADC 67729) reference in view of the Brown reference (WO 01/04581) and in view of the Brune et al. reference, U.S. Patent No: 6,756,783.**

Independent claims 10 and 40 were improperly rejected under 35 U.S.C. §103(a) over the C.K. Woodrow reference in view of the Brown reference and the Brune et al. reference. The

combination of references fails to establish a *prima facie* case of obviousness, and therefore the rejection must be withdrawn.

In the Response to Argument section of the Examiner's Answer, page 34, the C. K. Woodrow reference is again relied on as disclosing "automatically processing" and Figure 4 is again cited as evidence. As discussed above, the C.K. Woodrow graph illustrated in Figure 4 only reflects perturbations of temperature and there is no automatic processing. In fact, the Examiner's statement regarding "automatically processing" is directly contrary to the teachings of the C.K. Woodrow reference which describes manual interpretation of data, i.e. the exact opposite of the "automatically processing" element recited in independent claims 10 and 40. Addition of the Brown and Brune et al. references fails to obviate these deficiencies of disclosure with respect to the C.K. Woodrow reference. Accordingly, no prima facie case of obviousness can be established with respect independent claims 10 and 40.

In the Response to Argument section of the Examiner's Answer, pages 35 and 36, the Examiner again relies on the Brune et al. reference as disclosing missing elements of independent claims 10 and 40. Specifically, column 32, lines 5-9, of the Brune et al. reference is cited as disclosing the missing elements. However, Appellant respectfully submits that similar to the analysis regarding the C. K. Woodrow and Brown references, the Brune et al. reference has been relied on for teachings much broader than actually disclosed in the cited reference. In fact, the disclosure attributed to the Brune et al. reference can only be found in the present application. For example, column 32, lines 5-9 of the Brune et al. reference describes the Brune et al. match filter which is not "limited to use in drilling systems". However, the Brune et al. reference fails to disclose or suggest other specific features recited in independent claims 10 and 40 and also fails to describe the unique combination of elements found in these claims.

The new discussion found in the Examiner's Answer falls short of supplying the missing elements. By way of a few examples, discussion of a match filter in the Brune et al. reference does not disclose, teach or suggest automatically processing a temperature profile through application of a model-fitting algorithm by constructing a match filter, further wherein

constructing the match filter comprises "incorporating modifications to the filter to make it orthogonal to background trends" as recited in independent claim 10. Similarly, the Brune et al. description cannot be construed as disclosing, teaching or suggesting automatically processing data on specific events related to heat energy in a well by applying a model-fitting algorithm that comprises constructing a match filter and "using extrema of a convolution of the filter with data to select candidate depths, wherein constructing the match filter comprises incorporating modifications to the filter to make it orthogonal to background trends" as recited in independent claim 40. Neither the Brune et al. reference nor the other cited references discloses, teaches or suggests these elements. Accordingly, no prima facie case of obviousness can be established, and the rejection of claims 10 and 40 under 35 USC 103(a) must be withdrawn. It should be noted that much of the discussion related to the Brune et al. reference can be found in the June 15, 2009 Appeal Brief.

**j.) Rejection of claims 2 and 5 as unpatentable under 35 U.S.C. § 103(a) for being obvious over the Brown reference (WO 01/04581) in view of the Foster reference, U.S. Patent No: 3,275,980.**

Claims 2 and 5 were improperly rejected as obvious over the Brown reference in view of the Foster reference. No *prima facie* case of obviousness has been established. Claims 2 and 5 directly depend from independent claim 1 and are patentable over the cited references for at least the reasons cited in the June 15, 2009 Appeal Brief. Therefore, the rejection of dependent claims 2 and 5 under 35 USC 103(a) should be withdrawn.

**k.) Rejection of claims 3 and 11 as unpatentable under 35 U.S.C. § 103(a) for being obvious over the Brown reference (WO 01/04581) in view of the Van Bemmel et al. reference, U.S. Patent No: 6,201,884.**

Claims 3 and 11 were improperly rejected as obvious over the Brown reference in view of the Van Bemmel et al. reference. No *prima facie* case of obviousness has been established. Claims 3 and 11 directly depend from independent claim 1 and are patentable over the cited

references for at least the reasons cited in the June 15, 2009 Appeal Brief. Therefore, the rejection of dependent claims 3 and 11 under 35 USC 103(a) should be withdrawn.

**l.) Rejection of claim 4 as unpatentable under 35 U.S.C. § 103(a) for being obvious over the Brown reference (WO 01/04581) in view of the Charske et al. reference, U.S. Patent No: 2,938,592.**

Claim 4 was improperly rejected as obvious over the Brown reference in view of the Charske et al. reference. No *prima facie* case of obviousness has been established. Claim 4 directly depends from independent claim 1 and is patentable over the cited references for at least the reasons cited in the June 15, 2009 Appeal Brief. Therefore, the rejection of dependent claim 4 under 35 USC 103(a) should be withdrawn.

**m.) Rejection of claims 9, 15, 28 and 39 as unpatentable under 35 U.S.C. § 103(a) for being obvious over the Brown reference (WO 01/04581).**

Claims 9, 15, 28 and 39 were improperly rejected as obvious over the Brown reference. No *prima facie* case of obviousness has been established. Claims 9, 15, 28 and 39 ultimately depend from one of the independent claims 1, 22 or 31 and are patentable over the cited references for at least the reasons cited in the June 15, 2009 Appeal Brief. Therefore, the rejection of dependent claims 9, 15, 28 and 39 under 35 USC 103(a) should be withdrawn.

**n.) Rejection of claims 16-20 and 47 as unpatentable under 35 U.S.C. § 103(a) for being obvious over the Brown reference (WO 01/04581) in view of the Brune et al. reference, US Patent No: 6,756,783.**

Claims 16-20 and 47 were improperly rejected as obvious over the Brown reference in view of the Brune et al. reference. No *prima facie* case of obviousness has been established. Claims 16-20 and 47 ultimately depend from one of the independent claims 1 or 31 and are patentable over the cited references for at least the reasons cited in the June 15, 2009 Appeal

Brief. Therefore, the rejection of dependent claims 16-20 and 47 under 35 USC 103(a) should be withdrawn.

**o.) Rejection of claims 30 and 43-45 as unpatentable under 35 U.S.C. § 103(a) for being obvious over the Brown reference (WO 01/04581) in view of the C.K. Woodrow (SPE/IADC 67729) reference.**

Claims 30 and 43-45 were improperly rejected as obvious over the Brown reference in view of the C.K. Woodrow reference. No *prima facie* case of obviousness has been established. Claims 30 and 43-45 ultimately depend from one of the independent claims 22 or 31 and are patentable over the cited references for at least the reasons cited in the June 15, 2009 Appeal Brief. Therefore, the rejection of dependent claims 30 and 43-45 under 35 USC 103(a) should be withdrawn.

**p.) Rejection of claims 10 and 40 as unpatentable under 35 U.S.C. § 103(a) for being obvious over the Brown reference (WO 01/04581) and in view of the Brune et al. reference, U.S. Patent No: 6,756,783.**

Independent claims 10 and 40 were rejected under 35 U.S.C. §103(a) over the Brown reference in view of the Brune et al. reference. This rejection is respectfully traversed. The combination of references fails to establish a *prima facie* case of obviousness, and therefore the rejection must be withdrawn.

As discussed generally in sections b.), i.) above and in the June 15, 2009 Appeal Brief, the Brown reference fails to disclose or teach "automatically processing", e.g. automatically processing data to detect specific events related to heat energy in a well. Addition of the Brune et al. reference fails to obviate the deficiencies of disclosure with respect to the Brown reference.

Referring again to section i.) above and to the June 15, 2009 Appeal Brief, the combination of references also fails to disclose, teach or suggest numerous elements of

independent claim 10 or independent claim 40. By way of examples, the combination of references fails to disclose, teach or suggest automatically processing a temperature profile through application of a model-fitting algorithm by constructing a match filter, further wherein constructing the match filter comprises "incorporating modifications to the filter to make it orthogonal to background trends" as recited in independent claim 10. Similarly, the Brune et al. description cannot be construed as disclosing, teaching or suggesting automatically processing data on specific events related to heat energy in a well by applying a model-fitting algorithm that comprises constructing a match filter and "using extrema of a convolution of the filter with data to select candidate depths, wherein constructing the match filter comprises incorporating modifications to the filter to make it orthogonal to background trends" as recited in independent claim 40. Accordingly, no prima facie case of obviousness can be established, and the rejection of claims 10 and 40 under 35 USC 103(a) must be withdrawn

**q.) Rejection of claim 41 as unpatentable under 35 U.S.C. § 103(a) for being obvious over the Brown reference (WO 01/04581) in view of the Tubel reference, US Patent No: 6,012,015.**

Claim 41 was improperly rejected as obvious over the Brown reference in view of the Tubel reference. No *prima facie* case of obviousness has been established. Claim 41 directly depends from independent claim 31 and is patentable over the cited references for at least the reasons cited in the June 15, 2009 Appeal Brief. Therefore, the rejection of dependent claim 41 under 35 USC 103(a) should be withdrawn.

In view of the above remarks, Applicant respectfully submits the Examiner has provided no supportable position or evidence that any of the claims 1-11, 14-31, 34-41 and 43-48 is anticipated under 35 U.S.C. § 102(b) or obvious under 35 U.S.C. § 103(a). Accordingly, Applicant respectfully requests that the Board find claims 1-11, 14-31, 34-41 and 43-48 patentable over the art of record, withdraw all outstanding rejections, and allow claims 1-11, 14-31, 34-41 and 43-48.

Respectfully submitted,

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## 8.   **CLAIMS APPENDIX**

1.          A method for analyzing distributed temperature data from a well comprising:

using a distributed temperature sensor system to obtain temperature profile data along a portion of a wellbore;

providing the temperature profile data to a processor;

automatically determining whether fluids are flowing into or out of a tubing located in the well by processing the temperature profile data; and

highlighting valuable information to a user related to the flow of fluid relative to the tubing.

2.      The method as recited in claim 1, wherein automatically determining comprises removing noise from the temperature profile data.

3.      The method as recited in claim 1, wherein automatically determining comprises removing low order spatial trends.

4.      The method as recited in claim 1, wherein automatically determining comprises utilizing a high-pass filter.

5.      The method as recited in claim 1, wherein automatically determining comprises utilizing a low-pass filter.

6.      The method as recited in claim 1, wherein automatically determining comprises applying a model-fitting algorithm to the data.

7.      The method as recited in claim 6, wherein applying a model-fitting algorithm comprises selecting regions for fitting and fitting a model to data.

8. The method as recited in claim 7, wherein applying a model-fitting algorithm further comprises testing results for statistical significance.

9. The method as recited in claim 6, wherein applying a model-fitting algorithm comprises constructing a match filter and using extrema of a convolution of the filter with data to select candidate depths.

10. A method for analyzing distributed temperature data from a well, comprising:

obtaining temperature profile data along a portion of a wellbore;

providing the temperature profile data to a processor; and

automatically processing the temperature profile data to highlight valuable information to a user, wherein automatically processing comprises applying a model-fitting algorithm to the data and applying the model-fitting algorithm comprises constructing a match filter, further wherein constructing the match filter comprises incorporating modifications to the filter to make it orthogonal to background trends.

11. The method as recited in claim 1, wherein automatically determining comprises trend removal and filtering of the temperature profile data.

14. The method as recited in claim 1, wherein using comprises obtaining the temperature profile data with a temporary distributed temperature sensor installation.

15. The method as recited in claim 1, wherein using comprises obtaining the temperature profile data with a slickline distributed temperature sensing system.

16. The method as recited in claim 1, wherein automatically determining comprises utilizing a match filter.

17. The method as recited in claim 16, wherein the match filter is used to detect particular temperature signals corresponding to a particular downhole event.

18.    The method as recited in claim 17, wherein the downhole event comprises the location of a gas lift valve.

19.    The method as recited in claim 17, wherein the downhole event comprises a hole in a tubing.

20.    The method as recited in claim 17, wherein the downhole event comprises a leak in a wellbore completion tool.

21.    The method as recited in claim 1, wherein the automatically determining occurs in real-time with the obtaining data.

22.         A system to analyze distributed temperature data from a well, comprising:
            a distributed temperature sensor that measures temperature profile data along a portion of a wellbore;
            a processor that receives the temperature profile data in real time, the processor being programmed to identify a particular temperature signal that corresponds to a specific downhole event having an inflow of relatively cooler fluid; and
            wherein the processor outputs valuable information related to the specific downhole event to a user.

23.    The system as recited in claim 22, wherein the distributed temperature system comprises an optical fiber.

24.    The system as recited in claim 22, wherein the distributed temperature sensor comprises an opto-electronic unit to launch optical pulses downhole.

25.    The system as recited in claim 24, wherein the opto-electronic unit is coupled to the processor by a communication link.

26.     The system as recited in claim 25, wherein the communication link comprises a hardline link.

27.     The system as recited in claim 25, wherein the communication link comprises a wireless link.

28.     The system as recited in claim 22, wherein the processor is embodied in a portable computer.

29.     The system as recited in claim 23, further comprising a production tubing deployed in the wellbore with the optical fiber.

30.     The system as recited in claim 29, wherein the production tubing is combined with a gas lift system.

31.         A method of detecting certain events within a well, comprising:
            using a distributed temperature sensor system to obtain data related to temperature over a period of time along a portion of a wellbore;
            automatically processing the data to detect specific events related to heat energy in the well;
            further automatically processing the data to determine a flow rate of fluid in the well; and
            displaying results to a user.

34.     The method as recited in claim 31, wherein automatically processing comprises processing the data on a processor-based computer.

35.     The method as recited in claim 31, wherein automatically processing comprises processing backscattered light signals.

36.    The method as recited in claim 31, wherein automatically processing comprises applying a model-fitting algorithm to the data.

37.    The method as recited in claim 36, wherein applying a model-fitting algorithm comprises selecting regions for fitting and fitting a model to data.

38.    The method as recited in claim 37, wherein applying a model-fitting algorithm further comprises testing results for statistical significance.

39.    The method as recited in claim 36, wherein applying a model-fitting algorithm comprises constructing a match filter and using extrema of a convolution of the filter with data to select candidate depths.

40.    A method of detecting certain events within a well, comprising:

obtaining data over a period of time along a portion of a wellbore;

automatically processing the data to detect specific events related to heat energy in the well; and

displaying results to a user, wherein automatically processing comprises applying a model-fitting algorithm to the data and applying the model-fitting algorithm comprises constructing a match filter and using extrema of a convolution of the filter with data to select candidate depths, wherein constructing the match filter comprises incorporating modifications to the filter to make it orthogonal to background trends.

41.    The method as recited in claim 31, wherein automatically processing comprises applying a phenomenological model to the data.

43.    The method as recited in claim 31, wherein automatically processing comprises detecting particular temperature signals corresponding to location of a gas lift valve.

44.     The method as recited in claim 31, wherein automatically processing comprises detecting particular temperature signals corresponding to a wellbore completion tool leak.

45.     The method as recited in claim 31, wherein automatically processing comprises detecting particular temperature signals corresponding to a hole in a production tubing.

46.     The method as recited in claim 31, wherein displaying comprises displaying results in graphical form on a display monitor.

47.     The method as recited in claim 31, wherein automatically processing comprises utilizing a match filter.

48.     The method as recited in claim 31, wherein automatically processing occurs real-time with the obtaining data.

9. **<u>EVIDENCE APPENDIX</u>**

Not Applicable

10. **<u>RELATED PROCEEDINGS APPENDIX</u>**

Not Applicable